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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

DECEMBER 1947

EROSION CONTROL PRACTICES DIVISION

Influence of Organic Matter on Available Water Holding Capacity of Sandy Loam Soils - T. C. Peele, Clemson, S. C.-"In the past, much has been written about the influence of organic matter on the capacity of soils to retain water in a form available for plant use. But there have been no specific data showing the relation of organic matter content to available water holding capacity of soils of this region.

"Determinations of available water holding capacity and organic matter content of soil samples collected by Frank Lesesne (Survey Supervisor, SCS, Kingstree, S. C.) in connection with the permeability survey in South Carolina, have been made at the Soil Conservation Research Laboratory at Clemson.

"The organic matter content of 25 soil samples having a sandy loam texture, based on mechanical analysis determinations, were analyzed to determine their organic matter content and their available water holding capacity. The available water holding capacity is the percent water a soil can hold in the range between the field capacity and the permanent wilting point. The organic matter content was determined by the dry combustion method and the conventional factor 1.724 for converting percent organic matter was used.

"The equation for expressing the relation of these two soil properties to each other is $Y = 6.64 + .876 X$, where Y is the available water holding capacity in percent and X is the organic matter content of the soil in percent. The correlation coefficient of these properties is $r = 0.869$. It is significant at the 1% level.

"The organic matter content of the soils on which the calculations were based range from 0.31 to 5.65%. Most of the soil samples came from the flat-woods section of the coastal plains area.

"It will be noted from the equation that an increase of 1% in organic matter content produces an increase of 0.876% available water holding capacity."

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Sow Cover Crops Early Enough To Get Good Early Fall Growth - John T. Bregger, Clemson, S. C. - "Winter cover crops made the best growth ever obtained in the fall, especially rye which stooled out and completely covered the ground. While above normal rainfall in October and November were largely responsible, the main essential is to get the rye sown and germinated by the first week in October. The stooling period for rye occurs during October when the length of day is ideal for this plant function. When planted in late fall, even under ideal moisture conditions, rye usually comes up erect and somewhat spindling and does not stool out until the right length of day again occurs in the spring.

"Most of the annual trunk measurements were made on plot trees -- compilation of which will be made for Annual Report.

Soil Aggregation as a Result of Conservation Practices - "Inspired by the results of the earthworm survey made by Henry Hopp in 1946, determinations were made on soil samples taken in May to ascertain the degree of aggregation which had taken place under various soil conservation practices. As plot treatments, (with one exception) were established in 1940, the data show the accumulative effects of these cultural practices over a continuous period of seven years. (See Table).

Effect of Soil Conservation and Other Cultural Practices on Aggregation of Cecil Sandy Loam Soil in Experimental Peach Orchard

Soil Management Practice¹ No. & Time of Cultivation Degree of Aggregation

Fallow (check)	Continuous	39.2
Rye-crabgrass	3 spring, 1 fall	43.5
Vetch-crabgrass	3 spring, 1 fall	55.2
Sorghum pomace mulch	none	58.7
Crimson clover	none	63.1
Soybeans-Sudan grass	2 spring	63.5
Lespedeza sericea	none	63.6
Bur clover	none	63.6
Crotalaria spectabilis**	3 spring	67.5
Kobe lespedeza	none	68.9
Grain straw mulch	none	70.0

* Degree of aggregation is defined as the per cent of soil particles less than 0.20 mm. in size that have formed aggregates greater than 0.20 mm. in size.

** Treatment established four years after other treatments, following two years pretreatment with heavy soybean-Sudan grass cover crop.

"It will be noted that grain straw mulch (applied annually) gave the highest degree of aggregation. Incidentally the most earthworm activity had also occurred under this treatment. There were also earthworms under sorghum pomace, but they were much smaller than under the grain straw, probably due to a nitrogen deficiency.

"The other cultural treatments fall between the two extremes of fallow and grain straw mulch and vary as cultivation decreases and leguminous plant residues are allowed to accumulate on the soil surface. The greatest deterrent to soil aggregation appeared to be that of summer tillage, followed by the use of non-legume cover crops only (accompanied by cultivation)".

Stubble and Idle Land Accumulate Snow Over Winter and Increased Soil Moisture - Torlief S. Aasheim, Bozeman, Montana. - "The average moisture content of soil in the fall and at seeding time for the past seven years is summarized in the following table.

Average percent moisture per foot of soil in various summer fallow and stubble plots in the fall and succeeding spring and amount of moisture lost or gained between fall and spring. Fall samples taken during years 1940 to 1946 inclusive. Spring samples taken during years 1941 to 1947 inclusive. Froid, Montana.

Treatment		Ave. % Moisture	Ave. % Moisture	% Gain or Loss
		Per Foot Fall	Per Foot Spring	
Sweep S.S. Tiller	B	13.4	13.1	- 0.3
Sweep S.S. Tiller	T	13.7	13.6	- 0.1
Blade S.S. Tiller	T	13.2	13.6	+ 0.4
M.B. Plow, D.F. & W.	B	13.9	14.1	+ 0.2
M.B. Plow, D.F. & W.	T	13.2	12.9	- 0.3
M.B. Plow, D.F.	T	13.4	12.9	- 0.5
M.B. Plow, R.W.	T	12.6	13.2	+ 0.6
M.B. Plow B.L.	T	13.1	13.3	+ 0.2
Oneway	T	13.1	13.0	- 0.1
Corn Ground		10.6	11.1	+ 0.5
Idle (Weeds mowed)		9.0	11.0	+ 2.0
Idle		7.9	11.5	+ 3.6
<u>Stubble Plots</u>				
Stubble (Fall tilled)		9.8	11.9	+ 2.1
Stubble (Not tilled)		9.3	11.9	+ 2.6

B - Indicates stubble burned

T - Indicates stubble not burned

The approximate amount of actual rates gained or lost in inches may be derived by multiplying the figures in the right hand column by .8

Above table is compiled from moisture samples which were taken to a depth of five feet, therefore the gain or loss is for a five foot depth.

"This table indicates that in this area summer fallow neither gains nor loses much in the way of soil moisture during the winter months. Most of the precipitation is in the form of snow and this is generally accumulated in stubble fields and sheltered places, due to the high winds that occur. Stubble and idle fields where snow has accumulated have shown a very definite increase. The average gain indicated for the past seven years shows that accumulation of snow under these conditions is very important. It has been generally believed that most of the water from melting snows is lost in runoff. Amount of runoff will vary with the rate of thawing and degree to which the ground is frozen but snow accumulations apparently contribute more to soil moisture than it has generally been credited with doing."

Yields and Soil and Water Losses from Small Agricultural Watersheds -

O. E. Hays, LaCrosse, Wisconsin.--"Cultivated field areas at the Station consist of two watersheds and one terraced area. The untterraced cultivated watershed is farmed to a single crop each year with all farming operations on the contour. This watershed was established in 1932. Soil and water loss measurements are available from 1933 through 1946 and crop yield data from 1935 to date.

"The terraced area has a vertical interval of seven feet. The variable channel has a maximum grade of six inches fall per 100 feet at the outlet. The total length of the terrace is 1385 feet. This area was established in 1932. Soil and water loss data are available from 1933, yield data from 1935.

"Comparison of soil losses from the terraced area with losses from the contoured watershed shows six times more soil loss from the contoured area than from the terraced area under a three year rotation. Soil losses from the terraced area were still too high, indicating that at least one more year of hay should have been included in the rotation. Under the six year rotation, soil losses from the terraces were reduced to 2.2 tons per acre. Soil losses from the contoured area (12.3 tons) was still excessive, indicating the need for additional erosion control measures.

"Corn yields under the three year rotation were practically the same. Under the six year rotation the terraced area yield was 11 bushels per acre more than the yield from the contoured area. By using a longer rotation with more hay, corn yields were increased on both areas. The difference in corn yield can be attributed to the severe erosion which has taken place on the contoured area. Proper crop rotations with sufficient hay must be supplemented with good erosion control practices to maintain and increase crop yields.

SOIL AND WATER LOSSES

Treatment	3-Year Rotation		6-Year Rotation	
	1933-1940		1940-1946	
	Runoff	Soil Loss	Runoff	Soil Loss
	Inches	T/A	Inches	T/A
Terraced	3.83	5.38	2.12	2.41
Contoured	3.37	32.68	1.62	12.33

YIELD OF CROP

Treatment	3-Year Rotation			6-Year Rotation		
	1935-1940			1940-1946		
	Corn	Grain*	Hay	Corn	Grain	Hay
Terraced	46.56	17.98	1.38	67.0	76.6	2.97
Contoured	45.27	14.58	1.19	58.4	78.0	2.62

* Grain in 3-year rotation was barley.

** Grain in 6-year rotation was oats.

Corn and grain yields - bushels per acre; hay - tons per acre.

Reconnaissance Recording Rain Gages - "For those who are struggling to open reconnaissance type recording rain gages during the winter months, it is suggested that a three-inch band or skirt made from a heavy truck inner tube be fitted around the bottom of the gage cover. This should be so placed that it will extend over the rubber gasket on the base of the gage. Cut the three inch strip of rubber from the side of the inner tube so that when it is formed into a circle, one edge will have a slightly larger diameter. This edge extends down over the base while the other is stretched tight around the base of the cover.

"This procedure has been found satisfactory at La Crosse. It makes it much easier to open this type of gage during freezing weather."

Contour Farming Is Profitable - Ralph A. Cline, Brookings, South Dakota.-"Field trials for 1947 were summarized and the yield data averaged in with results secured during the past seven years. The records show that contour farming is profitable. It conserves moisture needed for plant growth and prevents soil losses. When compared to farming up and down the slope on comparable fields on the same farm, contouring has increased small grain yields 26.7 percent and row crop yields 21.6 percent. Soils with a deep topsoil have produced an average of 43.0 percent higher yields than identical areas in the same field from which the topsoil had been largely lost by erosion.

Crested Wheatgrass Controls Bindweeds in Low Rainfall Areas and Reduces it in Areas of Higher Rainfall - In areas of low rainfall crested wheatgrass has been able to establish itself in old stands of field bindweed (*Convolvulus arvensis*) and has satisfactorily controlled them where dense stands of grass are secured. In higher rainfall areas crested wheatgrass has reduced the stand and vigor of bindweeds but has not been as effective as in the drier areas."

Winter Grazing - B. H. Hendrickson, Watkinsville, Georgia.-"The Station Angus beef cattle herd, including young calves, as of December 31st numbers 32 head, or 23 cow units. They have access to 12.5 acres of permanent sod-clover bottomland pasture, and 53 acres of eroded upland pastures in various stages of development, in eight separate enclosures.

"These cattle have made excellent growth during the past season without barn feeding of any sort, from early March through December 31st.

"Green grazing crops on the Station, now, in early January, are bur clover, crimson clover and ryegrass, oats, oats and vetch, orchard grass, and Kentucky No. 31 fescue grass. Frosted kudzu is supplying considerable dry grazing.

"All of these winter grazing crops are being produced on eroded upland fields. The permanent pasture on bottomlands, based on Bermuda grass, has not furnished much winter grazing for the past several winters.

"One of the problems connected with winter grazing on eroded uplands is the matter of providing both "feed and footing", on land that is often saturated. Well established Kentucky No. 31 fescue grass seems to be outstanding, in this connection, with the crimson clover-ryegrass combination of winter annuals a close second."

Conservation Practices Good Insurance in Dry Year - George W. Hood, Batesville, Arkansas.-"The drought conditions of the past year made possible the comparison of yields from Conservation and Non-Conservation practices and stressed the influence of water on growth and yield and the evidence was all in favor of Conservation.

"The results on both Baxter and Ozark soils were similar as shown by the yield of cotton. The yield of seed cotton, where grown on Baxter soil with the slope of the land was 114 pounds per acre, as contrasted with cotton grown on the contour and in rotation where the yield averaged 400 pounds per acre, which was almost 4 times greater in favor of Conservation. The yield of seed cotton grown with the slope on Ozark soil was 228 pounds as contrasted with cotton grown on the contour, in rotation on strip crop pattern where the yield was 782 pounds per acre or almost 4 times greater in favor of Conservation. From observation during the growing season it seemed quite apparent that the one factor which made the difference in growth and subsequent yield was entirely one of moisture. The surplus water held on the land in the contour furrows and other conservation practices was the deciding factor in producing a profitable yield. All expenses of production were the same up to harvesting time but the non-conservation practices were failures, while the conservation practices were profitable."

Relationship of Soil Loss And Organic Matter Content - D. D. Smith, Columbia, Missouri.-"An estimate of allowable soil loss for Shelby, Marshall, and Putnam soils has been made using the relationship of organic matter and soil loss. Data were used from the Clarinda, Iowa, and Bethany, Missouri, control plots and the McCredie, Missouri, crop sequence plots.

Annual change (%) in organic matter content was plotted against annual soil loss (tons/acre) and a line fitted to the data. A loss in excess of 4 tons per acre for Marshall and Shelby, and 2-1/2 tons for Putnam, was accompanied by a decrease in organic matter content of the soil."

Effect of Land Resting - O. R. Neal, New Brunswick, New Jersey.-

"The practice of resting cultivated land for a year in close-growing, organic-matter producing crops has been found to be effective in reducing soil and water losses and in increasing the yield of subsequent crops. Results from studies on a number of privately-owned farms during past years have shown yield increases for corn, soybeans, sweet potatoes, tomatoes, lima beans, lettuce, and several other crops. During 1947 sweet corn was grown on areas that were rested during 1946 in clover and timothy, ryegrass and vetch, green-manuring with winter cover and soybeans, green-manuring with winter cover and broadcast corn, and on areas rested for two years in Lespedeza sericea. In the soybean and corn treatments the winter cover crop was disced down in spring and either soybeans or field corn sown broadcast. In early fall these crops were disced down and winter cover seeded. The 1947 yields of sweet corn following these treatments are shown in Table 1.

Effect of Land Resting on Sweet Corn Yields

Treatment	No. 1 ears/A.
Continuously cultivated - check	9600
Clover and timothy	14780
Ryegrass and vetch	15810
Winter cover and soybeans	17910
Winter cover and broadcast corn	10180
Lespedeza sericea - (2 yrs.)	14670

"Each of the resting treatments, except that with broadcast field corn, was effective in bringing about a large increase in the yield of sweet corn during the first year after treatment. Cultivation of these areas will be continued to determine the effect of the resting treatment on subsequent crops."

Effect of Cropping Practice on Soil Aggregation - Sterling J. Richards, New Brunswick, New Jersey.-"Aggregation studies were made for the 48 plots of Study I at Marlboro and the 12 potato rotation plots at the Vegetable Research Farm. The percentage aggregation of silt and clay into water stable aggregates greater than silt size was measured on a complete sample from each plot.

Study I - Marlboro

% Aggregation (Average of 4 plots)

Cropping System	Tomato Plots*	Corn Plots*	Cropped as shown*
I	55	59	63 - Peas & beans
II	65	60	64 - Sod
III	67	61	70 - Peas and Rye-grass and vetch
IV	70	66	67 - Sod

* Crops grown in 1947

Potato Rotation Plots

Treatment	% Aggregation (Ave. of 2 samples from each of 2 plots)
Continuous Potatoes	51
2 Yr. Rotation	
Potatoes, Wheat, Potatoes	56
Wheat, Potatoes, Wheat	58
3 Yr. Rotation	
Wheat, Clover, Potatoes	54
Clover, Potatoes, Wheat	58
Potatoes, Wheat, Clover	62

Production and Income From Various Drainage Profiles - H. O. Anderson, LaCrosse, Wisconsin.--"Data for the four-year period 1943-46, inclusive, was summarized for 28 farms in Lincoln County Soil Conservation District. The farms were grouped according to drainage profiles. The data will be analyzed and a report prepared shortly. This study was initiated to determine the probable production and income from various drainage profile soils. Farm records supervised by the University of Wisconsin and other agencies for the four-year period were summarized. These records included livestock production, income and expense items, only. Crop production and yield figures may be obtained on from 30-40 farms for 1947. These records are supervised by several outside agencies and the Soil Conservation Service contribution to the study includes only the work of summarization and analysis.

"Livestock production, gross and net income per acre were higher on the better drained heavy soils (3 profile) than they were on the poorly drained heavy soils (2 profile). Production and income were still lower, however, on the sandy land than on the two profile soil.

Table 1.--Livestock carrying capacity, gross receipts, gross expenses and net income per acre, 3 groups of farms, 1943-46.

	Acres Per Livestock Unit	Net Income Per acre	Interest on investment per acre
Heavy soil			
3 profile	1.7	\$39	17%
2 profile	1.9	\$30	14%
Sandy soil	2.2	\$15	9%

"The two profile farms made up for the lower quality of soil by larger acreages of cropland."

Table 2.--Livestock numbers and butterfat production per farm, three groups of farms, 1943-46

	Dairy cows	Hens	Hogs	Prod. Livestock units	Butterfat pounds	Butterfat per cow
Heavy soil						
3 profile	14.2	48	.5	18.8	3451	235
2 profile	15.2	73	3.7	23.2	3629	236
Sandy soil	13.3	50	1.2	18.2	2472	191

Rate of Decomposition of Certain Plant Residues - F. L. Duley, Lincoln, Nebraska.—"In the western part of the State farmers have long noticed that the roots of Carex filifolia, commonly called "niggerwool," remain in the soil for many years after the land is broken out of the native sod. We would like to have some mulch material that would be more resistant to decay than most crop residues. T. M. McCalla is therefore comparing the rate of decay of several plant materials which were inoculated with soil and kept under moist conditions. These were started October 21, 1946 and the percent of decay after different intervals is shown below:

<u>Material</u>	<u>Percent of material lost by decay after</u>		
	<u>2 months</u>	<u>6 months</u>	<u>1 year</u>
<u>Carex filifolia</u> (niggerwool)	9.9	13.0	14.1
<u>Carex filifolia</u> plus NH_4NO_3	11.8	15.6	17.2
Wheat straw	32.6	43.9	49.4
Wheat straw plus NH_4NO_3	43.2	50.6	55.0
Sweetclover	56.2	64.2	67.1

Use of Eccentric Disk and Cultipacker-Seeder Reduced Burroweed - Joel E. Fletcher, Tucson, Arizona.—"Counts of the mortality of burroweed plants due to the passage of the eccentric disk and cultipacker-seeder in the reseeding operation, indicate that about 67% of the plants are killed. It would seem that this is sufficient mortality to obviate any further treatment for elimination of competition from this source. Since no additional treatment is needed to reduce competition, the cost of the seeding operation can be considerably reduced by this procedure."

Field Demonstration in Virginia on Terracing and Row Layout - T. L. Copley, Raleigh, North Carolina.—"A terracing and row layout demonstration on a tobacco farm near South Hill, Virginia was held November 6. This was planned by Zone Conservationists in cooperation with District Conservationist, and included other agricultural workers and implement manufacturers. At their request I assisted with the row layout features of this demonstration. There were between 500 and 600 people present and the meeting was termed a huge success for all concerned."

Potato Committee Approves Work on Harvester - J. W. Slosser, Orono, Maine.—"Mr. R. B. Gray, Agricultural Engineer from Washington, visited the project at Orono and attended the conference of the Potato Committee. The committee voted the following actions: (1) that the two-row potato harvester be re-designed, repaired and tested again in 1948; (2) that a simple one-row unit harvester be designed and constructed for use in the fall of 1948; (3) that funds for construction, labor and supplies

be provided by the Experiment Station from the Potato Tax funds. A tentative figure of \$6,000 was set. (4) The Experiment Station will provide working space and storage for equipment constructed."

Seeding Vetch on Native and Bermuda Grass Sodds Gave Good Results - Harley A. Daniel, Guthrie, Oklahoma.-"In the fall of 1945, some vetch was seeded in established stands of native and Bermuda grass with various rates of phosphates being applied. The results of this test is given in the following Table.

Hay and Seed Yield of Vetch Seeded in Good Stands of Native and Bermuda Grass in 1946 at Guthrie, Oklahoma.

Location	Fertilizer Rate Per Acre Pounds	Yield Per Acre ^{1/}	
		Hay ^{2/}	Seed
Native grass on cleared scrubby oak land.	<u>Rock Phosphate</u>		
	100	1508	77
	200	1912	125
	300	1301	283
	<u>Super Phosphate</u>		
	100	1867	245
	200	2997	94
	300	2694	323
Bermuda grass	<u>Super Phosphate</u>		
	300	2468	173

1/ Vetch seeded at 20 pounds per acre in the fall of 1945; harvested in June 1946. Yields are the average of three samples taken from each treatment.

2/ Oven dry weight.

"The 300 pound rate of super phosphate an acre gave the highest seed yield on the native grass site. However, the 200 and 300 pound rates produced good forage yields. The vetch did not reduce the stand of native or Bermuda grass. There was also a fair volunteer stand of vetch on the areas in the spring of 1947. It is possible that the seeding of vetch in pastures will aid in increasing growth and the quality of the grass."

Windstorms of November 1947 In the Wind Erosion Area of Southern California - Maurice Donnelly, Riverside, California.-"Strong, but not unduly damaging winds blew in the wind erosion area of southern California in November 1947. Sandblowing was limited to surface drifting. Many of the winter cover crops had been planted by the end of the month and in general, wind velocities were not high enough to tear out seed beds. Practically all winter cover crops in the wind area are dry-farmed, that is, the cover crop is not irrigated. The rainfall record at Riverside, a record believed to be fairly represnetative of the wind area proper, was recently analyzed to determine which years have presented (1) favorable, (2) unfavorable, and (3) doubtful conditions for dry-farm winter cover crop

growth in the wind area. The period examined covers 24 years from 1924 to 1947 inclusive. A year is classed as favorable if sizeable rains fell not later than October 31. An unfavorable year is one in which sizeable rains fell not later than November 30. The number and percentage distribution of such years is given below:

	<u>Number of Years</u>	<u>Percentage</u>
Favorable	8	33
Unfavorable	11	46
Doubtful	5	21
Total	24	100 per cent

"The high percentage of unfavorable years emphasizes the need for some sort of surface protection (residues from previous cover crops, for instance) at the start of the windy season, which is about mid-October."

Decompositional History of Stubble Mulch on Grainland - "One phase of the work on stubble mulch on grainland is to follow the decompositional history of grain and cover crop residues. Dr. James P. Martin has analyzed Club Mariout barley straw from the Huston plots (1947 crop) near Beaumont to determine the nature of the material that would be leached from this straw by prolonged rains. He reports the following data:

Kind of Residue	*Total Nitrogen Per cent	*Water Soluble Material Per cent	*Organic Matter in Water Solu- ble Material Percent	*Total Nitrogen in Water Solu- ble Material Per Cent	Water Solu- ble Nitrogen in Straw Per cent
Bright straw	0.498	14.4	12.4	2.03	58.4
Partly weathered straw, some surficial roots	0.578	8.90	7.36	2.55	39.3

*Oven dry basis

"The per cent of water in the bright straw as it came from the field was 9.15; the partly weathered straw contained 7.47 per cent water."

Supplemental Irrigation of Field Corn at Clemson, S. C., increased the Yield from 22 to 110 Bushels Per Acre in 1947 Where the Corn was Spaced 14 Inches in the Drill in Rows 42 Inches Apart. - T. C. Peele, Clemson, S. C. - "The summer of 1947 was extremely dry. The influence of irrigation on yields of grain and silage in 1946 and 1947 is shown in the following table.

"In 1946, the corn was planted June 7 and required only two irrigations, June 11 and June 21. The fertilizer treatment was 1400 lbs. 4-10-6 per acre broadcast before planting, 700 lbs 4-10-6 at planting, and 200 lbs. N from ammonium nitrate as a side dressing in split applications.

"In 1947, the corn was planted May 23. It required irrigation July 14, July 28, August 20, and September 4. The fertilizer treatment was: 1000 lbs. cyanamid (about 220 pounds N) broadcast about 3 weeks before planting, 1400 lbs. 4-10-6 broadcast before planting, 700 lbs. 4-10-6 at planting, and 250 pounds muriate of potash per acre as a side dressing June 15. No fertilizer injury was noted either year.

"The corn variety both years was Funk's G 714. It lodged badly and the yields from the irrigated areas were lower than expected. It is contemplated that 5 or 6 different corn varieties will be included in the test next year."

Influence of irrigation on grain and silage yields of corn in 1946 and 1947.

Treatment	Spacing in rows	Distance between rows	Silage Yields	Grain Yields
			Tons/Acre	Bu./Acre
		<u>1946</u>		
Irrigated	9"	42"	37	137
Unirrigated	9"	42"	25	109
Irrigated	18"	42"	31	138
Unirrigated	18"	42"	23	116
		<u>1947</u>		
Irrigated	14"	21"	37	83
Unirrigated	14"	21"	16	14
Irrigated	14"	42"	35	110
Unirrigated	14"	42"	16	22

Tillage Methods and Stubble Utilization in Relation to Wheat Yields - Hugh C. McKay, St. Anthony, Idaho.-"Some very interesting results are being obtained from the permanent tillage plots established in 1939. These plots have had the same tillage methods on them since that time. The yield in bushels per acre for 1947 are as follows:

Tillage Method	Stubble Burned	Stubble Utilized	Average
Modified Moldboard	25.9	29.3	27.6
Moldboard	23.5	23.9	23.7
One Way Disk	25.2	23.8	24.5
Average	24.9	25.7	
One Way Disk 2000 lbs. straw	27.6		
One Way Disk 4000 lbs straw	27.5		
One Way Disk 75 lbs Am. Sulphate	26.0		
Ball Plow Moldboard	26.9		

"The modified moldboard stubble utilized plots gave the highest yield of 29.3 bushels per acre. These plots were outstanding in appearance during the summer and fall. They not only had the best growth of wheat but they had fewer weeds than any other plots. All of the stubble burned and moldboard plowed plots had considerable mustard growth this year.

"The data in the stubble utilized column clearly indicated that the highest yield is obtained by utilization of the residue on the surface of the soil. Over 5 bushels per acre increase was obtained by utilizing it on the surface rather than turning it down or mixing it with the surface soil with the one way disk.

"In the stubble burned plots there is not the spread in yield but the modified moldboard has still given the highest yield. The one way disk is the only tillage implement showing an increase in yield from burning of the stubble. The average of all implements shown an increase of .8 bu. per acre for the stubble utilized over the stubble burned plots.

"For the various implements the modified moldboard gives the highest average yield of 27.6 bu. per acre with the one way disk next with 24.5 bu and the moldboard plow last with 23.7 bu. per acre.

"The yield data for the various straw treatments shown there is very little difference between the 2000 lbs. straw plots and the 4000 lbs. straw plots. This could indicate that in this area, the amount of straw present does not effect the yield too much if a good job of summer fallowing is done.

"The application of 75 lbs of Amm. Sulphate did not increase the yield. This is similar to results obtained in other years.

"Fall plowing with the moldboard showed a definite advantage over spring plowing."

Effect of Pasture Management on Earthworms - C. A. Van Doren, Urbana, Illinois.-"Earthworm counts were made on some of the pasture plots. With no treatment considerably larger numbers of earthworms were found on the moderately grazed than on the severely grazed plots. The reverse was true on the treated plots. The average live weight of earthworms was appreciably greater on the treated, moderately grazed plot than on any other.

Number and Size of Earthworms on Pasture Plots(1)

Plot	Treatment	Ave. No.	Wt. Worms	Ave. Live
		Worms per Sq. Ft.	per sq. Ft. (gms.)	Wt. Worms (gms.)
7A	Treated, severely grazed	24.6	9.38	0.38
7	Treated, moderately grazed	15.2	8.18	0.54
9A	Untreated, severely grazed	4.3	1.60	0.37
9	Untreated, moderately grazed	18.0	3.21	0.18

(1) Average values of 5 samples (one square foot - 8 inches deep)

Tillage Methods and Straw Applications in Relation to Wheat Yields - G. M. Horner, Pullman, Washington.-"The yields of winter wheat grown on stubble mulch fallow have been significantly lower than that on land tilled with a moldboard plow and without a surface vegetal cover. Results for 1947 and averages for the past five years are given below:

Initial tillage for summer fallow	Straw Applied (tons/A)	Wheat 1947 (bu/A)	Yield 1943-47 (bu/A)
Subsurface tiller	2	25.7	29.6
"	1	24.3	31.2
"	0	28.3	33.4
Moldboard plow	2	33.9	34.4
"	1	30.3	34.9
"	0	36.0	37.3

"An average decrease in yield of about the same amount occurred on the 22 stubble mulch field trials conducted in the Central Whitman SCD. The dominant factor causing this yield depression seems to be a nitrogen deficiency under a stubble mulch. Field trials with nitrogen fertilizers during the last four years show that the yield depression can be eliminated with an application of 20 pounds of nitrogen per acre."

Blade Subsurface Tiller Conserves Moisture on Fallow Land -
Torlief S. Aasheim.-

Average percent of moisture per foot (to a depth of five feet) in summer fallow at the North Montana Branch Station, Havre, Montana. Spring '47

Method of Fallow	Burned	Not Burned	Average
Sweep S.S. Tiller	11.1	10.6	10.9
Blade S.S. Tiller	12.3	12.8	12.6
Average	11.7	11.7	11.7
Mold boardless plow	11.7	11.2	11.5
Oneway	12.0	11.7	11.9
Average	11.9	11.5	11.7
Moldboard plow D.F.	11.9	11.6	11.8
Moldboard plow R.W.	11.9	10.3	11.1
Average	11.9	11.0	11.5
Average of all plots			11.6
Average of all burned plots			11.8
Average of all unburned plots			11.4

"These results are in agreement with results obtained during the four previous years. The blade sub-surface tilled fallow shows the greatest amount of moisture conserved. The blade does a better job of controlling weeds than the sweep subsurface tiller and the difference in amount of moisture conserved between these two implements is attributed to this fact. Burned plots have also been consistently higher in amount of moisture conserved. This is attributed to several factors. There has been no runoff on any of the plots which has prevented unburned plots from gaining an advantage. In addition to this, better weed control has been accomplished on burned plots and some moisture is lost in the process of decomposing residues left on the land."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Mr. Schiff reports that transmission studies are indicating that available storage within the soil is a major factor in surface runoff. Tentative findings indicate that runoff starts on Keene silt loam when the soil moisture content in the topsoil is about 0.43 inch per inch of soil. This value is slightly higher for Muskingum silt loam. Studies also include the time required for water to drain from Keene silt loam and Muskingum silt loam under natural conditions. For example, it requires about 40 hours for Keene silt loam topsoil to drain from a soil moisture content of 0.35 inch per inch of soil to field capacity, whereas, about 20 hours are required for Muskingum silt loam over the same range.

"Percolation rates at the top of the subsoil did not exceed 0.31 inch per hour for Keene silt loam for the 1947 storms investigated; this was caused by low transmission rates in the subsoil. When intensities of rainfall require a transmission rate (linear velocity) of over about 15 inches per hour in the topsoil, runoff occurs. As saturation is approached the transmission rate in the topsoil is considerably below 15 inches per hour. (A 2-inch intensity requires a transmission rate of about 10 inches per hour at field capacity).

"In order to investigate means of speeding up the percolation rate of water into and through the subsoil, consideration has been given to breaking up the subsoil mechanically. A Killifer with a chisel point was pulled through the soil to a depth of 18 inches. The cuts were made at a spacing of 1 foot for half the width of a 70-foot strip. In the other half of the strip, the spacing was 2 feet. Moisture in the subsoil was below field capacity. Because of the low moisture content, the subsoil was severely shattered by the chisel. It was deemed more desirable to rip the subsoil when it was dry than to wait until spring. Then the soil is more plastic.

"Half of the strip is to be plowed for corn this spring. The other half is to be in trash-mulch corn. Soil samples for volume weight and porosity were taken before the deep tillage operation. Similar samples taken after this tillage and at corn seeding time will show the amount of deterioration.

"In cooperation with the American Steel and Wire Company, a contour fence has been constructed on the station. One section of the fence has a 920-foot radius and the other 221 feet. Steel posts on the former are spaced at 1 rod and on the latter, 12 feet. Reference points have been established to measure post deflections and heaving. At one end of each section of fence, there are attachments to provide means for measuring tension. Experienced farmers and technicians who observed the fence stretching felt that it was easier to stretch a fence on a curve than in a straight line. The fence looked better and seemed to be tight enough with less tension than if the fence had been straight."

Hydrologic Studies - John A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebr.--"A report on 'Rates of Runoff for the Design of Conservation Structures in the Central Great Plains of Nebraska and Kansas' was started and Parts I and II were completed during the month. This report involves the analysis of 8 years of runoff. Records on this station and the analysis of United States Geological Survey stream-flow data in the area of application. Weather Bureau and other information was used in the testing of records for a representative sample. The completed report will be submitted in January."

Hydrologic Studies - George A. Crabb, Jr., East Lansing, Mich.--"Precipitation for the months of June-December 1947, as measured by the United States Weather Bureau type non-recording rain gages, was as follows:

Month	Cultivated : watersheds Inches	Wooded : watershed Inches	Stubble-mulch : plots Inches	40-year average, : East Lansing Inches
Dec.	1.45	0.96	1.31	2.03
Nov.	1.49	1.79	1.53	2.48
Oct.	2.73	3.08	2.54	2.39
Sept.	6.14	5.66	5.45	2.91
Aug.	4.25	5.33	3.24	3.86
July	2.56	2.81	2.63	3.10
June	2.69	3.31	2.55	3.68
<u>TOTAL</u>	<u>21.31</u>	<u>22.94</u>	<u>19.25</u>	<u>20.45</u>

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.--"The following table shows the 1947 corn yields from the tillage experiment plots on the Throckmorton Farm at Lafayette:

Table 1.--1947 Corn yields, crop residue mgt. & mulch tillage plots
Purdue-Throckmorton Farm, Lafayette, Ind.

Treat- ment No.	Residue location	Initial depth of tillage	Yields, Bu./Acre :High Fert. ^{1/} :Low Fert. ^{2/}	
1	Surface	3", seeding strip only	64.0	56.8
2	"	3", overall	68.5	55.8
3	"	7", "	73.8	66.7
4	Mixed, 0-3"	3", overall	80.6	65.8
5	" , 0-3"	7", "	78.6	68.6
6	" , 0-7"	7", "	80.7	71.9
7	Under, 7"	7", "	83.9	80.8
8	" , 7"	10", "	77.7	81.2

LS_D₀₅: Tillage = 8.7; Fert. = 3.0; Tillage x Fertilization = 10.8

^{1/}125 lbs. of 8-8-8 with seeding, plus 375 lbs. of 8-8-8 in bands 5" below seed.

^{2/}125 lbs. of 8-8-8 with seeding, only.

"Only residue and tillage treatments 1, 2, and 3 produced yields significantly lower than conventional plowing (treatment #7), with the high level fertilization; whereas, all treatments except subsoil plowing produced significantly lower yields than conventional plowing at the lower fertilization level. The yield differences between conventional plowing and subsoil plowing were not significant at either fertilization level. As in previous years, the mixing of residues into the soil produced yields substantially higher than were obtained with surface mulch treatments, and at the high fertilization level, the mixing of residues through the soil produced as high yields as plowing them under. Observations of the plots have indicated that the mixing of the residues through the soil, particularly in the 0-3 inch zone, afforded substantial improvement in water intake of the soil and appreciable protection against erosion.

"The 'hummocky land' corn plots this year included the same tillage treatments as the experiment at the Throckmorton Farm, but only the high fertilization. The results are given in the following table:"

Table 2.--1947 corn yields, crop residue mgt. & mulch tillage plots
Noble County Farm, Albion, Ind.

Treat- ment No.	Residue location	Initial depth of tillage	Yields, Bu./Acre High Fert. ^{1/}
1	Surface	3", seeding strip only	56.9
2	"	3", overall	56.0
3	"	7", "	57.5
4	Mixed, 0-3"	7", overall	55.3
5	" , 0-3"	7", "	60.0
6	" , 0-7"	7", "	61.3
7	Under, 7"	7", overall	55.6
8	" , 7"	10", "	66.1

$$ISD_{05} = 7.3 \text{ bu./A.}$$

^{1/}125 lbs. of 8-8-8 with seeding, plus 375 lbs. of 8-8-8 in bands of 5" below seed.

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.--"Rainfall for the month of December was 3.65 inches compared with a normal of 2.98 inches. This is the first month of more than average rainfall since March, 1947. For the year 1947 the total rainfall was 9.87 inches less than the normal and all this deficiency occurred from June 1 to November 30, a six month period. At the end of the year there was still a deficiency of soil moisture except in the surface foot. There has been no runoff from any of the areas since July. Fall oats, clovers, and grasses have come up to a good stand during the month. Plants are small and are not in good condition for extremely cold winter weather.

"A short paper on the effects of conservation practices was presented at the Winter meeting of the American Society of Agricultural Engineers in Chicago. Most of the information in this paper has been previously reported in monthly reports."

Runoff Studies - T. W. Edminster, Blacksburg, Virginia.-"On December 12 Mr. Robert Warner and Mr. Norman W. Wilson, SCS Flood Control Engineers, stationed at Staunton, Virginia, visited the Blacksburg Office to discuss problems that they were meeting in the determination of the peak rates of runoff from watersheds in the headwaters of the Potomac River. They pointed out that the computed peak rates derived from the procedures that had been set up for use in Virginia appeared to exceed observed peak rates of runoff based on cross section surveys and observed high water marks by as much as two or three times. Comparison of the values to be published in the Ridges and Valleys peak rate bulletin with some of the data that they brought with them showed that the observed discharges in the Ridges and Valleys data were in close accord. Summaries of the analysis of these problems have been forwarded to individuals who are closely concerned with this problem.

"At the request of SCS personnel and representatives of the American Bankers Association, a report was prepared on possible hydrologic research needs for a complete James River Watershed Flood Control Program based on concerted conservation practices carried out by state and federal agencies.

"During December Mrs. Martha Roane collected a number of samples of algae and started the initial culture of these materials in carrying out her phase of the study of the use of biotic materials for reducing seepage in farm ponds. Mr. Holtan completed the construction of a soil compression instrument in which he utilized a hydraulic jack tapped out and equipped with a 3,000 pound gage, the cylinder liner of an obsolete make of automobile and its piston and connecting rod. After experiencing considerable difficulty in finding a satisfactory filter, he found that the use of a sand layer placed on filter paper and covered with filter paper would withstand the working pressures much better than the standard Plaster Paris filters. The soil samples are then placed on this sand filter and compressed to equilibrium at various moisture contents. These tests will make available information as to the optimum moisture conditions that should exist for pond bottom mechanical soil compaction. Information as to the pressure requirements for the optimum compaction of these soils at various moisture levels will also be found. It is Mr. Holtan's plan to select standardized samples from these compression tests for checking their seepage resistance under varying heads of water and under various depths of mantle."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-

"Mr. Donnelly spent the entire month making tests of the box-inlet drop spillway. Six tests were made to complete the rating tests begun last month on a spillway box having a length one-half the width and a depth equal to the width. Twelve tests were run to determine the effect of submergence on the flow over the spillway using two different outlet sizes.

"Miss Gosslin completed the computing and checking of equations for the box-inlet drop spillway rating curves. The coefficients and exponent in these equations were computed by the method of least squares. The forms of the equations used in the analysis, together with their standard errors of estimate corrected for sample sizes, S, are as follows:

$$Q = CL \sqrt{2g} (H_e - H_{e,Q=0})^{3/2} \quad S = 0.0031 \quad (1)$$

$$Q = C_1 L H_e^n \quad S = 0.0046 \quad (2)$$

$$Q = C_2 g^{1/2} L H_e^{3/2} + C_3 g^{1/2} H_e^{5/2} \quad S = 0.0056 \quad (3)$$

$$Q = Q_0 + C_4 g^{1/2} L H_e^{3/2} + C_5 g^{1/2} H_e^{5/2} \quad S = 0.0052 \quad (4)$$

Where Q is the discharge; L the crest length; H_e the observed head plus the velocity head at the head measuring section; $H_{e,Q=0}$ a zero correction to the head; Q_0 a zero correction to the discharge; g acceleration of gravity, 32.2; C, C_1 , C_2 , C_3 , C_4 , C_5 are coefficients; and n an exponent. The standard error of estimate is the average for nine tests, each having a different width of approach channel.

"In Equation (1) $H_{e,Q=0}$ came out a constant at 0.0073 with a standard deviation, $S = 0.0012$. This equation gave the best overall results. The coefficient C varied in a consistent manner with approach channel width. No reliable trend could be observed for the coefficients computed for the remaining equations. The exponent of Equation (2) also showed no trend nor was it constant. It varied from 1.57 to 1.70. The coefficients for Equations (3) and (4) were difficult to compute accurately even though the figures were carried out to the capacity of the calculating machine. It is interesting to note that the standard errors of estimate for Equations (3) and (4) are 81 percent and 68 percent respectively greater than that for Equation (1). This is probably because Equations (3) and (4) do not represent the data as well as does Equation (1), but some of the difference is undoubtedly a result of the mechanical difficulty in computing the coefficients. The standard error of estimate of Equation (2) is 48 percent greater than that for Equation (1), indicating that it also does not fit the data as well as Equation (1). We may then assume that Equation (1) gives the overall best results.

"However, the physical significance of $H_{e,Q=0}$ in Equation (1) has eluded us so far. Until the zero correction can be interpreted, it is hardly safe to use Equation (1) outside the range used during the model tests. If $H_{e,Q=0}$ were zero, all difficulties would be eliminated. However, the chance that it is zero is only about one in 5 million since $H_{e,Q=0}$ is six standard deviations greater than zero. Its magnitude and constancy are such that it cannot be ascribed to errors in obtaining the zero head on the spillway crest. Efforts will be continued to either explain the physical significance of $H_{e,Q=0}$ or to overcome the difficulty by other means.

"Mr. Blaisdell was able to spend some time on the pipe drop inlet spillway study. Two of the previous test series were partially analyzed and considerable time was spent on the redesign of a test setup to increase its flexibility and improve certain features of its operation. The lucite pipe used in the tests is necessarily installed at room temperature while the water used is close to the freezing point at this time of year. The temperature difference contracts the pipe, opens the joints, and permits air to enter, which invalidates the results. The new setup will recirculate the water which will be stored at approximately room temperature. A constant-level tank will also be used in the new setup to insure a steady supply to the models. It is hoped that this refinement will eliminate some of the troublesome fluctuations in the head and discharge of the models at some flows."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma. - "Two experiments were performed during this period. These were:

Channel	Experiment	Cover	No. of flows
U2	5	Long dormant Bermuda	8
U2	6	Long dormant Bermuda	4

These experiments will be described briefly.

"The cover was an uncut, dormant Bermuda grass. The cover length averaged about 6 inches in the upper half of the channel and about 8 inches in the lower half of the channel. The soil in the channel bed was a sandy loam.

"Experiment 5 consisted of passing 8 flows down the channel ranging from 0.02 to 7.8 cubic feet per second. The three largest flows were maintained for approximately 40 minutes each. Care was taken not to exceed the estimated permissible velocity. A plot of the n -VR curve showed the retardance of this cover to lie between the class B and C groups. Reach B had slightly higher retardance characteristics than reach A. The

result was exactly that expected. The object of the experiment was to determine as closely as possible the discharge required to produce a velocity of 5 feet per second. This information was needed for the next experiment.

"Experiment 6 was run to test the estimated permissible velocity for this cover and soil texture combination. On the basis of the results of experiment 4 run the previous year the permissible velocity for this channel was judged to be 5.0 feet per second. To check this estimate the channel was subjected to a flow with a velocity of 5 feet per second for 8 hours. The flow was interrupted every 2 hours to examine to channel bed for damage. The flow used was 10.7 cubic feet per second. The mean velocity in the upper half of the channel was 5.1 feet per second and in the lower half 4.75 feet per second.

"The 8-hour flow did no damage to the lower half of the channel. The upper half, however, showed some erosion. A few holes 0.05 to 0.10 foot deep were scoured out in areas of the thinner cover. This experiment indicates that 5 feet per second is a safe or permissible velocity for sandy loam only when the Bermuda grass cover is complete and good. For thinner covers a safe velocity would be somewhat less."

Sedimentation Studies - L. C. Gottschalk, Washington, D. C.-

"Principal activity this month was in connection with preparation of the annotated bibliography of sedimentation. About two-thirds of the 4,000 annotations in our files were reviewed to select the more pertinent ones for inclusion in the bibliography. Annotations were also written for 115 additional articles which previously had not been included in our files. These were principally articles which were published after work on the sedimentation literature project was terminated in 1941.

"On December 5, Carl Brown presented a paper entitled 'Damages Resulting from Uncontrolled Runoff and Silt Movement' before the meeting of the Soil Conservation Society of America held at Omaha, Nebr."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"From the first of November to the 17th of November very little rain fell in this area and as a result the loss in water table was high for this period. Losses ranged from 0.25 of a foot in the marl lands to 0.88 of a foot at Well No. 8, which is one-half mile north of the Sub-Tropical Experiment Station. Losses in water-table elevation for the northern part of the area ranged from 0.52 to 0.83 of a foot and for the Mowry St. profile losses range from 0.40 of a foot in the marl lands to 0.65 of a foot for the back country. For the period 11-17 to 11-24, approximately 5 inches of rain fell throughout the area with a result that we had little loss in our water table for that period. For the month, losses ranged from 0.14 of a foot for the coastal area to 0.53 of a foot

for the interior portion. Our well readings for the period indicate that because of the excessively high tides, (the highest recorded 3.12 feet above M.S.L.) the heavy out flow of water during this time of the year was retarded. The greater loss in the interior can be accounted for in that we had a high water table with a steep gradient. It shall be interesting to see what effect the high water table to the west will have on the water table for this area during the coming months and what effect it will have on stabilizing the water table for this area.

"Our work to date has shown that in young plantings the mulching of young trees definitely conserves nitrates. In one case the young trees were kept mulched with grass and in the other almost clean cultivation is practiced. In the clean tilled area during the past several weeks with two rains of over 1.5 inches each, practically all of the nitrates were lost whereas in the mulched area the loss was approximately 50 PPM. At the beginning of this period this mulched area had approximately 150 PPM of nitrates. Sampling after these rains we found that there still remained approximately 100 PPM.

"Analysis of samples for the Homestead area shows that the chloride concentration is low for the area protected by chloride barriers. Due to high tides the area lying below 2 feet were found to be somewhat higher in chlorides than the past month. This condition was found along the Mowry St. canal which is not protected with a barrier, the high tides backed the water out into small field canals and in one case we found 1800 PPM of chlorides in the surface layer.

"Also during this period water samples were collected on the Goulds, Military and Florida City canals. During the heavy rains the farmers removed the upper gates on the Military and Goulds canals. Our sampling showed that the high tides were driving the salt back into the canals. As a result of this sampling the gates were placed back in operation."

Drainage Studies - Ellis G. Diseker, Raleigh, N. C.-"Observations, and a study of the water table curves, show that the tile installed 4 feet deep is not satisfactorily draining the soil at the Bethel Experiment. This is not due to a partially submerged outlet during flood stage. Poor drainage has also prevailed throughout most of the year in the original depression in the field and where the old ditches were filled. This is particularly true where the ditches were filled even between bed drains, some open ditches, and all tile lines. This will be discussed more fully in the annual report.

"Due to poor drainage during the extremely wet fall, the soybeans planted over the tile--installed 3 and 4 feet deep--have not yet been harvested. At this time a large quantity of the beans has shattered out and an appreciable amount of those remaining on the stalks have badly deteriorated. Two attempts were made to harvest the beans with

a combine, but the tractor mired down in crossing the old ditches that had been eliminated. According to the water table curves, these beans could have been harvested at one time this fall, but the farmers were busy harvesting beans and peanuts on other areas."

Supplemental Irrigation Studies - John R. Carreker, Athens, Georgia.-"Harvesting corn on the field studies plots was completed December 3. A summary of the yields for the 3 spacing and 4 fertilizer variations with and without irrigation is given in Table 1.

Table 1. Summation of 1947 Corn Yields**

Fertilizer Rate*	Irrigated hill spacings			Unirrigated hill spacings		
	12 In.	18 In.	24 In.	12 In.	18 In.	24 In.
	Bushels per acre					
A	84.7	76.7	66.1	76.4	56.5	55.3
B	112.8	92.8	83.6	80.9	63.7	62.4
C	124.1	95.1	79.5	82.3	70.1	68.5
D	116.6	100.3	82.8	79.8	73.3	65.9

* Rates of fertilizer used were:

Rate	At Planting	Side Dressing		N-P ₂ O ₅ -K ₂ O 2 5 2	
	in Row 4-10-6	1st Cult. 4-10-6	2nd Cult. N. of soda		
		Pounds per acre			
A	500	0	0		20 - 50 - 30
B	500	0	250	60 - 50 - 30	
C	500	0	500	100 - 50 - 30	
D	500	500	500	120 - 100 - 60	

Note: All rows were spaced 42 inches apart.

** The yields were computed on the basis of 100 percent stand from the total of individual hills not adjacent to a skip in each row.

"Four principle conclusions can be drawn from these data:

1. Irrigation increased the yield for all fertilized and spacing comparisons.
2. The higher yields were with the closer hill spacings with and without irrigation, but to a larger extent with irrigation.
3. Larger quantities of nitrogen increased the yield, but larger quantities of phosphate and potash did not result in increased yields, both with and without irrigation.
4. Increased quantity of nitrogen and close hill spacing under irrigation gave the largest yields."

IRRIGATION DIVISION

Storage of Water Underground by Spreading - A. T. Mitchelson - Dean C. Muckel - Hayden K. Rouse, Berkeley, Calif.-"The Madera experimental spreading plot has been prepared for operation as soon as water is available. Part of the plot has been sub-soiled and releveled and on these strips where experimental crops are to be grown, the seed has been sown. Preparations have also been started for operation of the Minter Field and Wasco ponds. The installation of a pond with a buffer strip surrounding it is about to be installed in order to observe what percentage if any of the percolation is chargeable to lateral movement of the percolating water. At the request of Muckel, Mr. Aronovici who has been making a study of the possible increase in the rate of percolation of water by spreading by the addition of a detergent, has completed that study. In addition, the measurement of the effect of large concentrations of detergent, a small quantity (100 ppm) was added to water used in measuring the coefficient of permeability of a third duplicate set of samples similar to those described in the November progress report. The detergent used for this last run was Santomerse No. 1, Sample No. 47-4-16 manufactured by the Monsanto Chemical Company. Comparison of this run with the check measurement showed somewhat higher initial rates. Over a period of weeks, however, the rates fell below those of the check samples. A brief report is now in preparation describing in detail the procedures and results obtained from this study. It now appears certain that any quantities of detergent similar to the samples submitted to this laboratory for study will not raise the intake rates of water into soil, and may actually lower them."

Flow of Water in Irrigation Conduits - Fred C. Scobey, Berkeley, Calif.-"Tests - San Diego Aqueduct. For more than a year Mr. Scobey has been preparing for capacity tests on the San Diego Aqueduct, following request from Julian Hinds, General Manager and Chief Engineer of the Metropolitan Water District of California, and from Joseph Burkholder, General Manager and Chief Engineer for San Diego County Water Authority.

"The whole aqueduct was designed by Bureau of Reclamation in Denver, using Mr. Scobey's formulae, with recommendations made for the best grade of pipe as was known 30 years ago. However, in a memorandum to E. A. Moritz, Regional Director of USBR at Boulder City, dated March 1946 it was pointed out that current knowledge of concrete pipes would justify coefficients indicating a capacity some 8 percent or more than that developed from the use of our old coefficients. However, the old figures were used.

"For next month's report figures for some 60 observations on 48, 54, and 96-inch pipes of both concrete and steel will be given, with velocities from about 2 feet per second to more than 8 feet per second in 48-inch pipe."

San Fernando Valley Investigation - William W. Donnan, Los Angeles, Calif.--"The peg log model of the underground stratification in San Fernando Valley was completed. Examinations of the logs reveal a stratification sequence of water-bearing aquifers converging on the high-water table area. Leakage between strata may be causing the high water table. Water-table elevations from observation wells installed in 1922 were secured. When plotted on the 1947 water-table contour map, these data reveal almost an identical high water-table condition at that early date. An attempt will be made to relate the rise and fall of the water-table trend to the dry and wet cycles of rainfall."

V. S. Aronovici, Pomona, Calif.--"A one square mile area was selected for intensive soil study. This area is located in the southwest portion of the San Fernando Valley Soil Conservation District. Borings were made to a depth of 9 feet in each 40-acre unit. Data derived from these borings were plotted on an aerial map. Several 'undisturbed' samples were taken for volume weight determinations. A series of disturbed samples were obtained at two locations for estimating the coefficients of permeability. Permeability was measured by means of the tension table unit. This unit, as described in detail in previous monthly reports, proved highly satisfactory as a guide to relative permeability values."

Imperial Valley Investigation - William W. Donnan, Los Angeles, Calif.--"The following are tabulations from some pumping trials on the two deep gravel envelope drainage wells installed in Imperial Valley:

<u>Draw down</u> <u>Feet</u>	<u>Time run</u>	<u>Gals. per minute</u>
<u>West side well</u>		
25.5	12 days	663
26.0	36 "	569
<u>East side well</u>		
31.6	46 hours	2,066
32.0	8 days	1,695
36.5	26 hours	1,777

"Despite the fact that large quantities of water are being pumped the effect on the adjacent water table is not great. In the west side well the effect of pumping is felt for about 1,000 feet to the east, south, and north, but the effect to the west is nullified by the adjacent large canal."

Upper Santa Ana River - Dean C. Muckel, Pomona, Calif.--"Preliminary monthly transpiration rates for the non-irrigation season have been worked out for the Chino Basin crops. These include 11 irrigated crops and 9 unirrigated and native plants. A final summary of initial fall soil moisture deficiencies was also completed for a normal season in Chino Basin."

"One series of soil samples was taken in the Puente Hills after a 1-1/2-inch rain. This is the first rain in this area since last December. According to the Weather Bureau, the calendar year of 1947 is the driest 12-month period on record for Southern California."

Water Application Efficiencies in Irrigation - Harry F. Blaney, Los Angeles, Calif.-"In collaboration with Dr. O. W. Israelsen of the Utah Agricultural College, a revision was made of the manuscript on 'Water Application Efficiencies in Irrigation' for publication by the Utah State Agricultural College. This bulletin summarizes the results of research on irrigation efficiency conducted by the Soil Conservation Service in cooperation with the Agricultural Experiment Stations in Utah, California and New Mexico."

Evaporation from Water Surfaces - Harry F. Blaney, Los Angeles, Calif.-"California State Bulletin No. 54, 'Evaporation from Water Surfaces in California' by the late Arthur A. Young, has been printed by the Division of Water Resources, State of California. This report presents a summary of pan records and coefficients from 1881 to 1946. Some 250 evaporation records throughout the State are reviewed. The data will be helpful in designing new reservoirs and estimating evaporation losses from others."

Permeability Studies - V. S. Aronovici, Pomona, Calif.-"A study of possible increase in the rate of water intake for water spreading, by the addition of a detergent was completed. In addition, the measurement of the effect of large concentrations of detergent, a small quantity (100 p.p.m.) was added to water used in measuring the coefficient of permeability of a third duplicate set of samples similar to those described in the November progress report. The detergent used for this last run was Santomerse No. 1, Sample No. 47-4-16 manufactured by the Monsanto Chemical Company.

"Comparison of this run with the check measurement showed somewhat higher initial rates. Over a period of weeks, however, the rates fell below those of the check samples. A brief report is now in preparation describing in detail the procedures and results obtained from this study. It now appears certain that any quantities of detergent similar to the samples submitted for study will not raise the intake rates of water into soil, and may actually lower them."

Irrigation Studies - George D. Clyde, Logan, Utah.-"D. K. Fuhrman described the objectives, procedures and utility of the water supply forecasting program in Utah before the annual Utah Extension Leaders Conference, which was held in Logan, Utah, December 16-20. He reports great interest expressed by the irrigation leaders present, showing that the water-supply forecasting service provided by the Soil Conservation Service is considered extremely valuable both by the farmers and the business men alike."

"Preliminary snow surveys at key stations have been made as of the end of December. They indicate a subnormal accumulation.

"J. H. Maughan reports progress in summarizing the field data covering 38 organized drainage districts in Utah. These summaries cover the organization of districts and their procedure in setting up and forwarding district activities, including financing, installation of drains, and the operation and maintenance of the system. The financing was usually by bond issue and most of the districts issuing bonds encountered extreme financial difficulties during the early 1930's. The record of drainage district financing, together with that of installing and operating the drains, reveals the many problems encountered by drainage districts in carrying out their obligation to provide drainage for the agricultural lands within this area.

"W. C. Barrett reports the completion of the two models of power driven over-snow vehicles. The USGS model, using the Crosley motor, transmission, wheels and brakes and built in cooperation with the USGS, developed difficulty with the cast iron brake shoes. They were replaced by steel shoes and this machine will now undergo severe field trials over 18,000 miles of mountainous Idaho terrain in connection with streamflow measurements.

"The Utah snowmobile has been field trialed and has proven to be quite satisfactory for conditions encountered in the Utah mountains. It is now in regular service, making trips to the snow courses on the high watersheds.

"C. W. Lauritzen reports his review before the Extension Leaders Conference of present trends in canal lining. His statement was brief but it summarized effectively the present status of thinking relative to canal lining."

Silt Studies - Dean W. Bloodgood, Austin, Texas.-"Some time was spent during the month going through our silt records and counting the number of daily observations we have made for a number of stations on some of the watersheds in Texas. These data are to be used for a Preliminary Inventory of Published and Unpublished Sediment Load Data for Texas. At the end of the month 82,597 observations had been made at 40 stations on 10 of the watersheds of Texas. Data for the inventory have been typed in table form. To complete the record it will be necessary to add the number of observations for 3 stations on the Red River, 2 on the Rio Grande, and one on the Lavaca River. Aside from inventory of silt data for Texas it is planned to list silt observations made at United States Yuma Field Station (Colorado River) near Bard, Calif. for the years 1933 - 1938 (average about 48 observations per year) that were used to determine depth of silt deposition on land for each irrigation that was applied. These data are contained in the annual progress reports of irrigation data gathered at the United States Yuma Field Station, Bard, Calif. for the years 1933, 1934, 1935, 1936, 1937 and 1938."

Irrigation Studies - Dean W. Bloodgood, Austin, Texas.-"The Maverick County Water Control and Improvement District No. 1 at Eagle Pass plans to cooperate in the installation and operation of four to five water-measuring devices for the irrigation of crops in the Eagle Pass Area. Weirs, equipped with flow recorders, will be installed at three concrete drops for the measurement of water (lateral No. 22) to one 700 to 1,000-acre tract of mixed vegetables, cotton, and feed crops in the Hopedale Area (smaller tracts will be selected for single crop irrigations); one tract of about 400 acres (south of Eagle Pass on lateral 40D) - mostly vegetables; and one tract of about 200 acres (also south of Eagle Pass and on lateral 40D) - mostly vegetables. One 2 foot concrete Parshall flume, equipped with flow recorder, is being considered for the measurement of water to the Jack Keisling (one of the district board directors) cotton farm (125 acres) located about 5 miles south of El Indio. Another smaller concrete Parshall flume will be installed on the C. S. Lee Cotton Farm (portion of several hundred acres) that is located south of Eagle Pass. The construction of the 2-foot concrete Parshall flume on the Keisling farm will be completed by the latter part of January as the owner plans to irrigate the cotton land before planting during the early part of February."

Evaporation Studies - Dean W. Bloodgood, Austin, Texas.-"A plastic container for shipping silt samples to the laboratory has been designed. Heretofore single paper bottle containers have been used for mailing samples. The life of these containers is short and they are quite expensive. It is believed that the proposed plastic container will reduce the handling costs of the silt samples. A copy of the drawing will be sent upon request."

Irrigation Studies - Homer J. Stockwell, Fort Collins, Colo.-"Work was continued on checking the tests made last summer on losses through valves and fittings at the Belvue laboratory. The data for the four and six-inch valves were specially checked to determine whether there were any errors which might explain the discrepancy in the losses for the different sizes of valves. No significant errors were found."

"The galley proofs for the report by Mr. Rohwer, 'Seepage Losses from Irrigation Channels', is now available for checking. The State Board of Agriculture has voted a fund of \$1,130 to print the report."

"In reference to the snow survey project the transcript of the Colorado River Forecast Committee Meeting at Los Angeles on April 16, 1947, has been assembled and sent to Logan, Utah, for mimeographing. Some work has been done on the snow survey summaries for the Colorado and Missouri-Arkansas Basins. Supplies for snow surveyors for the 1948 season have been processed and sent to the field. Work is in progress on some new trail and snow course markers. At the present time it appears that the snow survey program will have to be severely curtailed due to financial considerations this season."

Irrigation Studies - Stephen J. Mech, Prosser, Washington.-

"This project was called on for information on infiltration, soil losses, and peak moisture utilization. Soil moisture utilization as obtained from our soil moisture samples was furnished. The following peak values were presented and incorporated in the various irrigation guides:

	Inches per day	Period
Wheat	0.35	5/6 - 6/8
Potatoes	0.32	6/29 - 7/9
Alfalfa	0.34	7/13 - 24

"These peaks were approximately 50 percent greater than the values computed based on Weather Bureau data. This difference is attributed to the fact that the computed values were based on monthly averages of temperature, etc., whereas the critical period is usually much shorter as shown by the above table. It was agreed that far better values will be obtained if the weather data for periods approximating the shortest interval between irrigations is used instead of monthly averages.

"Another point of interest was our reported use of approximately 19 inches of soil moisture for wheat for the period 5/16-7/18. This is a consumption considerably greater than generally accepted. The wheat in question was seeded in March as a companion crop for alfalfa and was cut early for hay."

2/16/48

